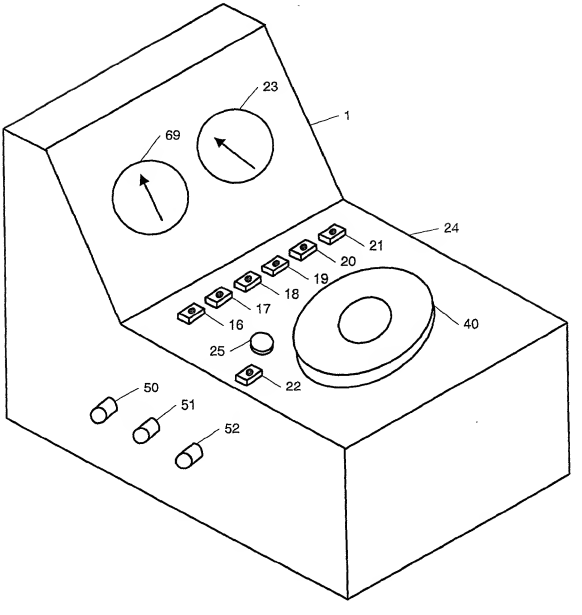


FIG. 1

TOUSIMIS-12/5/2001

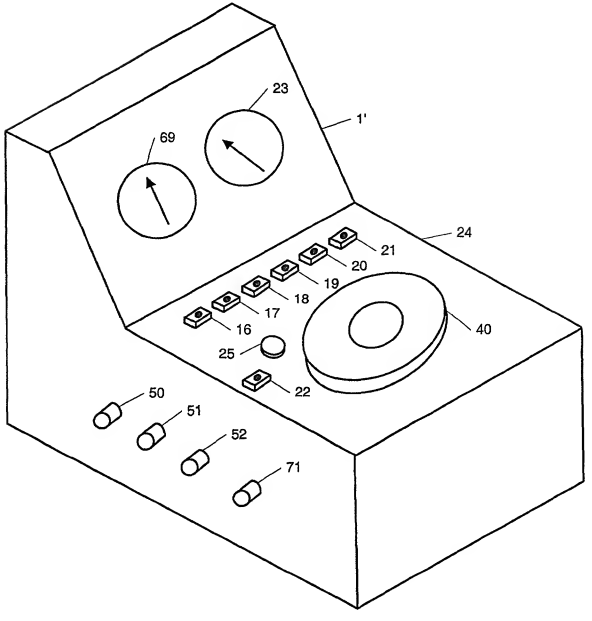


FIG. 2

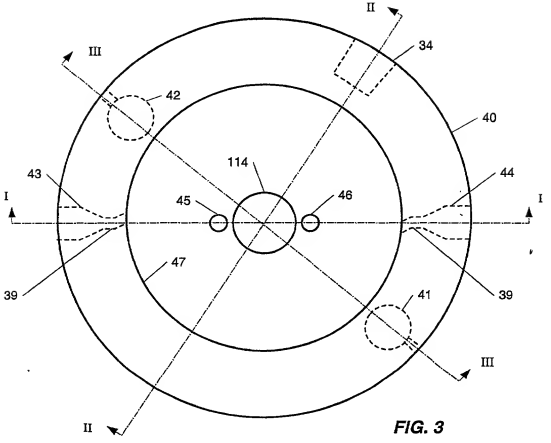


FIG. 3

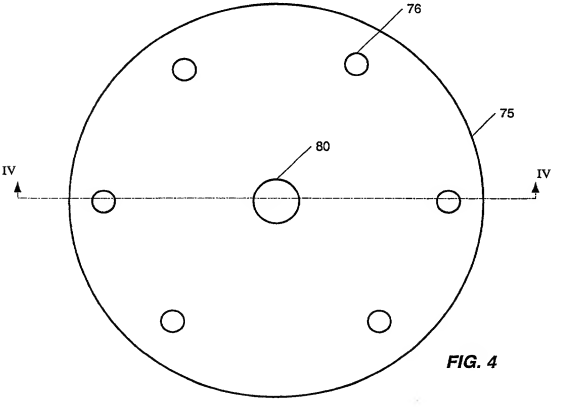


FIG. 4

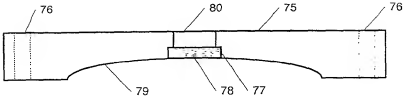


FIG. 5

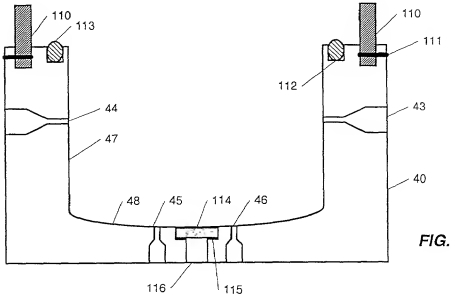


FIG. 6

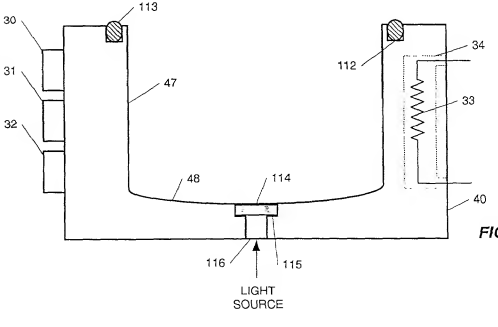


FIG. 7

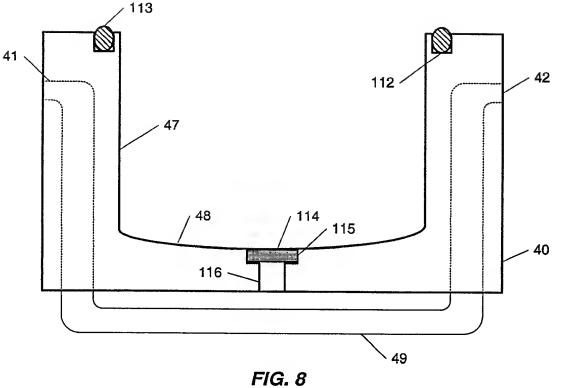
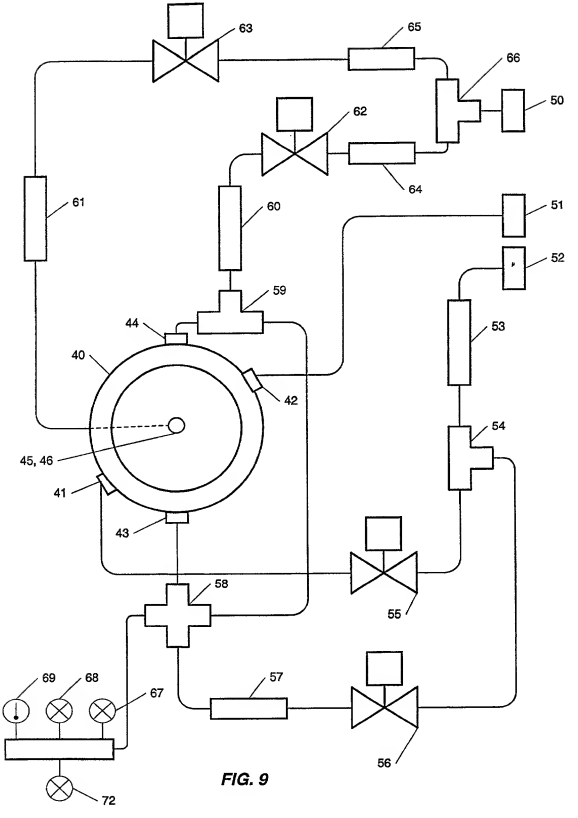


FIG. 8


63
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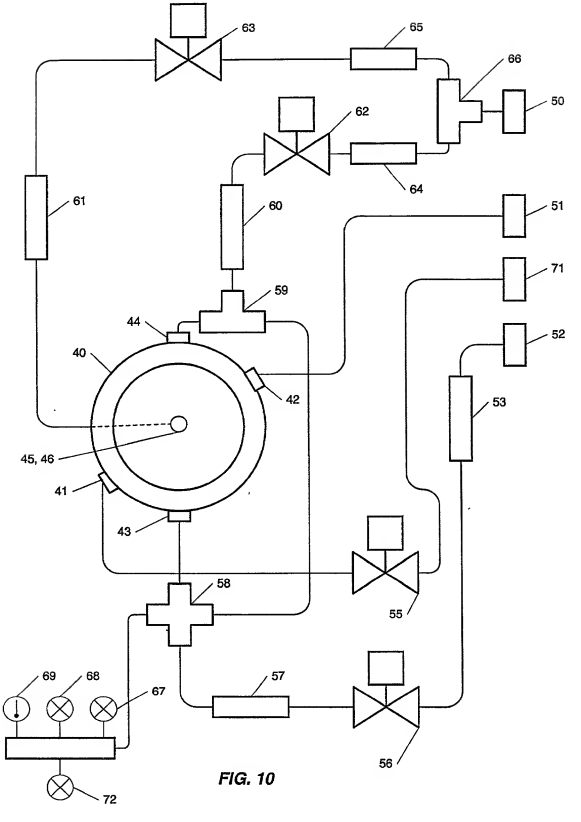
72

FIG. 9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72

FIG. 10

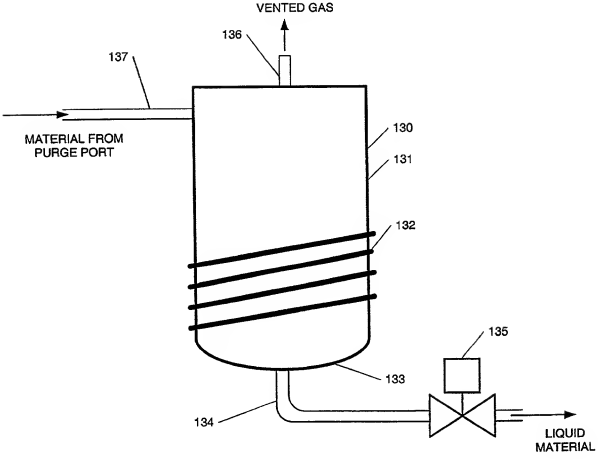
VENTED GAS
136
137
MATERIAL FROM
PURGE PORT
130
131
132
135
133
134
LIQUID
MATERIAL

FIG. 11

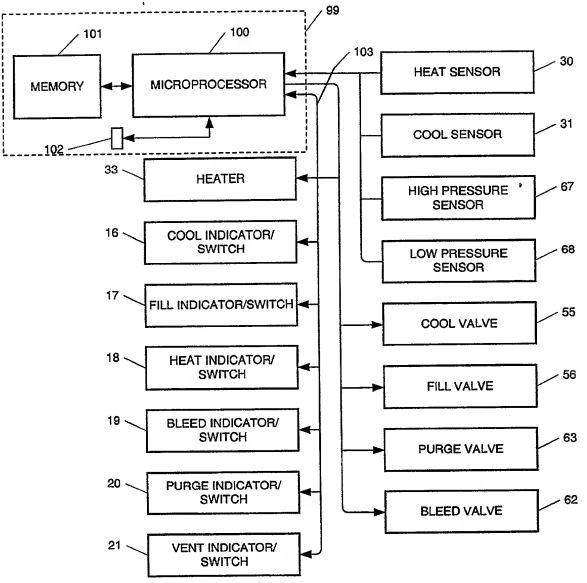
99
101
100
MEMORY
MICROPROCESSOR
102
103
HEAT SENSOR
30
COOL SENSOR
31
HIGH PRESSURE SENSOR
67
LOW PRESSURE SENSOR
68
33
HEATER
16
COOL INDICATOR/ SWITCH
17
FILL INDICATOR/SWITCH
18
HEAT INDICATOR/ SWITCH
19
BLEED INDICATOR/ SWITCH
20
PURGE INDICATOR/ SWITCH
21
VENT INDICATOR/ SWITCH
COOL VALVE
55
FILL VALVE
56
PURGE VALVE
63
BLEED VALVE
62

FIG. 12

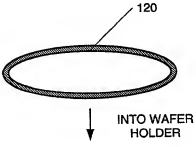

FIG. 13A

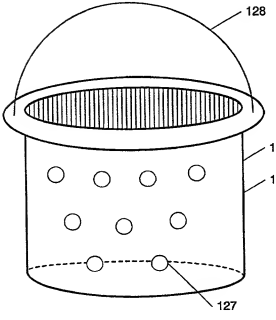

FIG. 13B

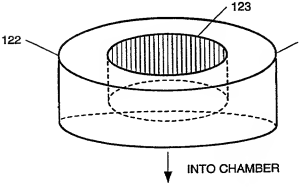

FIG. 13C

Anastasios TOUSIMIS, et al.
A HOLDER FOR USE IN SEMICONDUCTOR DEVICE MANUFACTURING AND BIOMEDICAL SAMPLE PROCESSING
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FIG. 13D

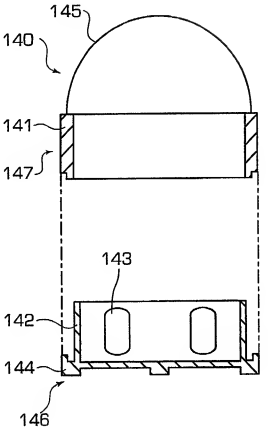


FIG. 13E

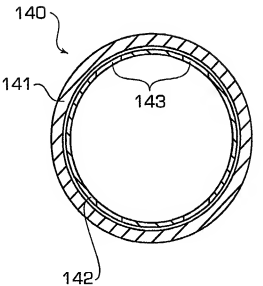


FIG. 13F
SEALED POSITION

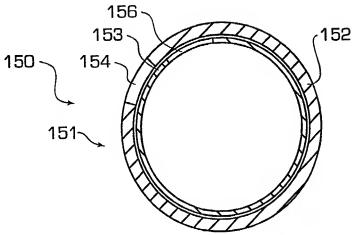


FIG. 13H
FLOW THROUGH POSITION

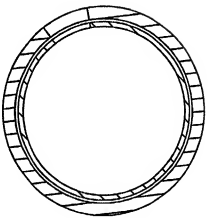


FIG. 13G

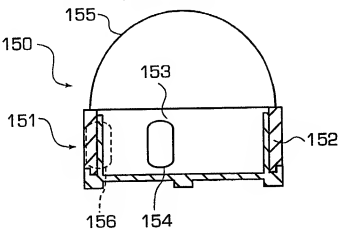
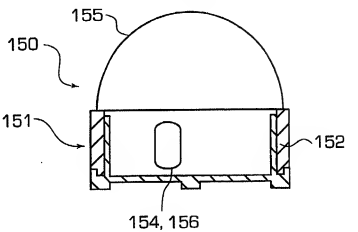


FIG. 13I



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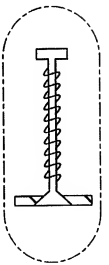

FIG. 13K
SEALED

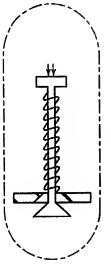

FIG. 13L
FLOW THROUGH

FIG. 13J

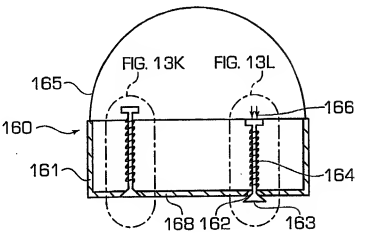

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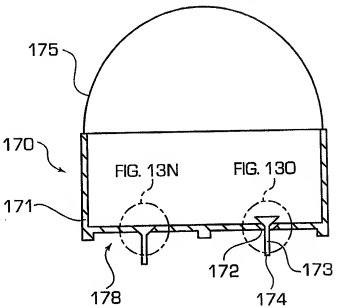
FIG. 13N
SEALED

FIG. 13O
FLOW THROUGH

FIG. 13M



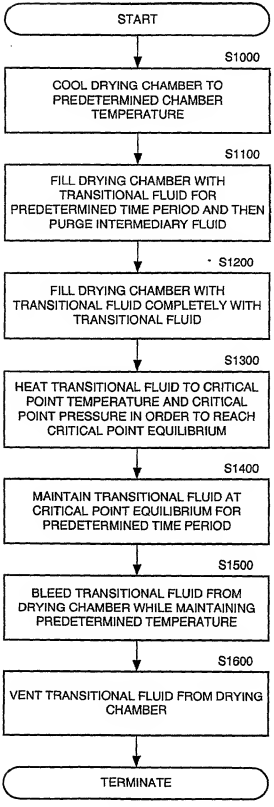

START
S1000
COOL DRYING CHAMBER TO PREDETERMINED CHAMBER TEMPERATURE
S1100
FILL DRYING CHAMBER WITH TRANSITIONAL FLUID FOR PREDETERMINED TIME PERIOD AND THEN PURGE INTERMEDIARY FLUID
S1200
FILL DRYING CHAMBER WITH TRANSITIONAL FLUID COMPLETELY WITH TRANSITIONAL FLUID
S1300
HEAT TRANSITIONAL FLUID TO CRITICAL POINT TEMPERATURE AND CRITICAL POINT PRESSURE IN ORDER TO REACH CRITICAL POINT EQUILIBRIUM
S1400
MAINTAIN TRANSITIONAL FLUID AT CRITICAL POINT EQUILIBRIUM FOR PREDETERMINED TIME PERIOD
S1500
BLEED TRANSITIONAL FLUID FROM DRYING CHAMBER WHILE MAINTAINING PREDETERMINED TEMPERATURE
S1600
VENT TRANSITIONAL FLUID FROM DRYING CHAMBER
TERMINATE

FIG. 14

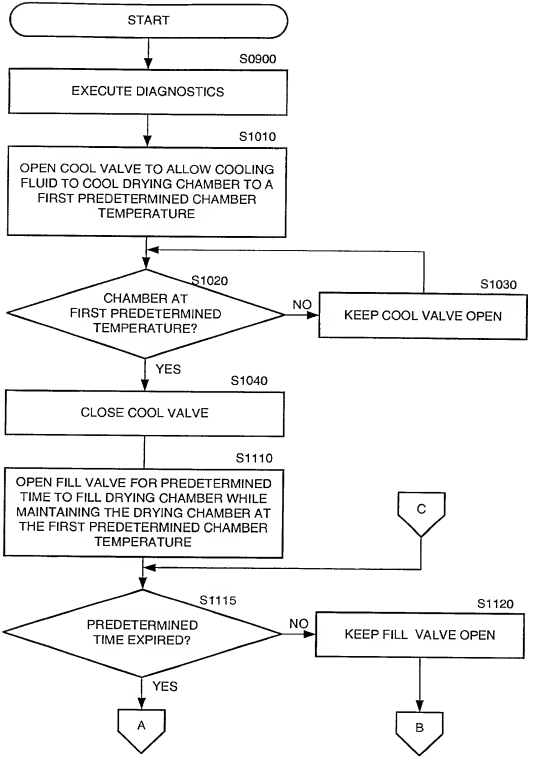

START
S0900
EXECUTE DIAGNOSTICS
S1010
OPEN COOL VALVE TO ALLOW COOLING FLUID TO COOL DRYING CHAMBER TO A FIRST PREDETERMINED CHAMBER TEMPERATURE
S1020
CHAMBER AT FIRST PREDETERMINED TEMPERATURE?
NO
S1030
KEEP COOL VALVE OPEN
YES
S1040
CLOSE COOL VALVE
S1110
OPEN FILL VALVE FOR PREDETERMINED TIME TO FILL DRYING CHAMBER WHILE MAINTAINING THE DRYING CHAMBER AT THE FIRST PREDETERMINED CHAMBER TEMPERATURE
C
S1115
PREDETERMINED TIME EXPIRED?
NO
S1120
KEEP FILL VALVE OPEN
YES
A
B

FIG. 15A

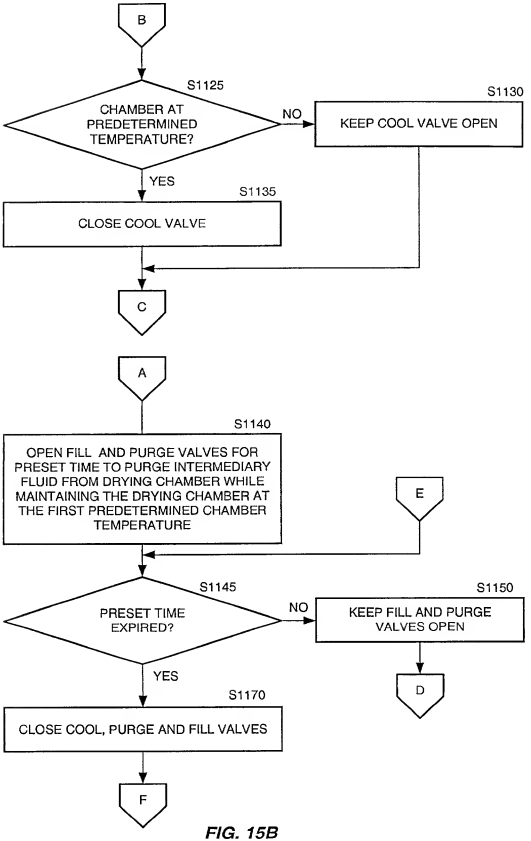

B
S1125
CHAMBER AT PREDETERMINED TEMPERATURE?
NO
S1130
KEEP COOL VALVE OPEN
YES
S1135
CLOSE COOL VALVE
C
A
S1140
OPEN FILL AND PURGE VALVES FOR PRESET TIME TO PURGE INTERMEDIARY FLUID FROM DRYING CHAMBER WHILE MAINTAINING THE DRYING CHAMBER AT THE FIRST PREDETERMINED CHAMBER TEMPERATURE
E
S1145
PRESET TIME EXPIRED?
NO
S1150
KEEP FILL AND PURGE VALVES OPEN
D
YES
S1170
CLOSE COOL, PURGE AND FILL VALVES
F

FIG. 15B

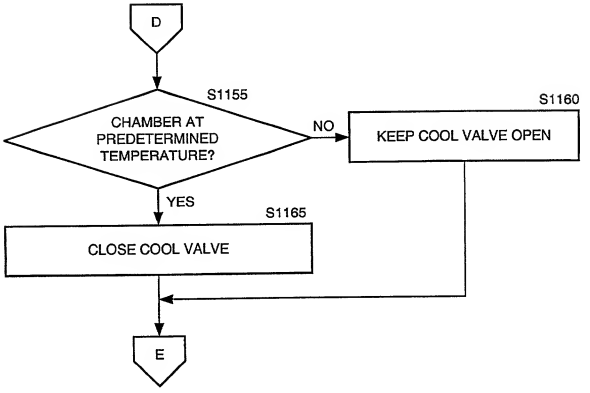

D
S1155
CHAMBER AT PREDETERMINED TEMPERATURE?
NO
S1160
KEEP COOL VALVE OPEN
YES
S1165
CLOSE COOL VALVE
E

FIG. 15C

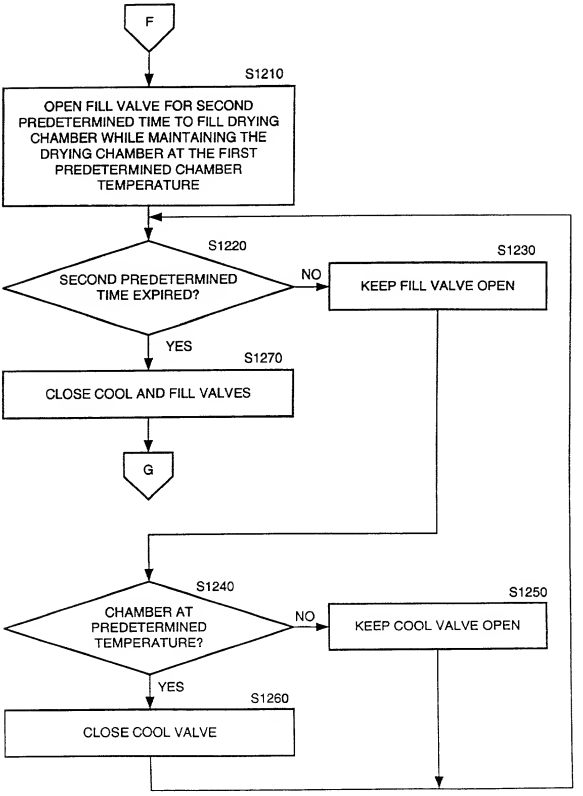

F
S1210
OPEN FILL VALVE FOR SECOND PREDETERMINED TIME TO FILL DRYING CHAMBER WHILE MAINTAINING THE DRYING CHAMBER AT THE FIRST PREDETERMINED CHAMBER TEMPERATURE
S1220
SECOND PREDETERMINED TIME EXPIRED?
NO
S1230
KEEP FILL VALVE OPEN
YES
S1270
CLOSE COOL AND FILL VALVES
G
S1240
CHAMBER AT PREDETERMINED TEMPERATURE?
NO
S1250
KEEP COOL VALVE OPEN
YES
S1260
CLOSE COOL VALVE

FIG. 15D

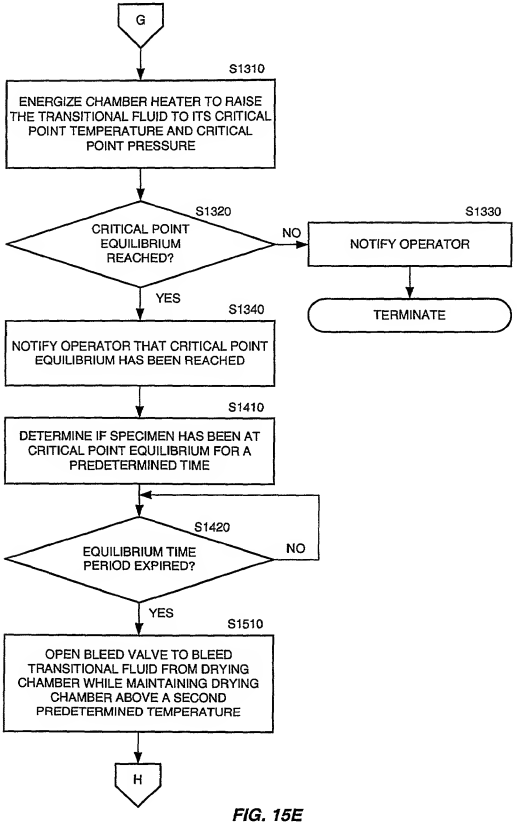

G
S1310
ENERGIZE CHAMBER HEATER TO RAISE THE TRANSITIONAL FLUID TO ITS CRITICAL POINT TEMPERATURE AND CRITICAL POINT PRESSURE
S1320
CRITICAL POINT EQUILIBRIUM REACHED?
NO
S1330
NOTIFY OPERATOR
TERMINATE
YES
S1340
NOTIFY OPERATOR THAT CRITICAL POINT EQUILIBRIUM HAS BEEN REACHED
S1410
DETERMINE IF SPECIMEN HAS BEEN AT CRITICAL POINT EQUILIBRIUM FOR A PREDETERMINED TIME
S1420
EQUILIBRIUM TIME PERIOD EXPIRED?
NO
YES
S1510
OPEN BLEED VALVE TO BLEED TRANSITIONAL FLUID FROM DRYING CHAMBER WHILE MAINTAINING DRYING CHAMBER ABOVE A SECOND PREDETERMINED TEMPERATURE
H

FIG. 15E

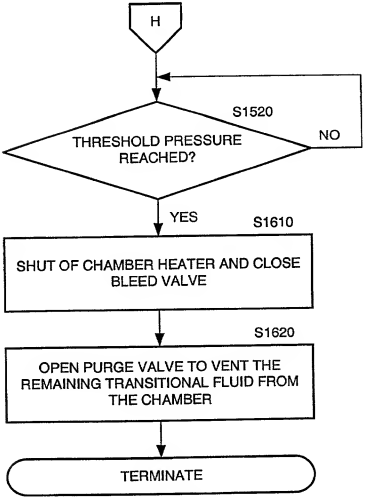

H
S1520
THRESHOLD PRESSURE REACHED?
NO
YES
S1610
SHUT OF CHAMBER HEATER AND CLOSE BLEED VALVE
S1620
OPEN PURGE VALVE TO VENT THE REMAINING TRANSITIONAL FLUID FROM THE CHAMBER
TERMINATE

FIG. 15F

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MODE	COOL VALVE	FILL VALVE	PURGE VALVE	BLEED VALVE	VALVE OPERATIONS
COOL	OPEN	CLOSED	CLOSED	CLOSED	COOL VALVE STAYS OPEN UNTIL CHAMBER TEMPERATURE < 5º C
FILL (1)	AS NEEDED	OPEN	CLOSED	CLOSED	PRESET BASED ON CHAMBER SIZE; COOL VALVE CYCLES TO KEEP CHAMBER TEMPERATURE < 5º C
PURGE	AS NEEDED	OPEN	OPEN	CLOSED	PRESET BY OPERATOR; COOL VALVE CYCLES TO KEEP CHAMBER TEMPERATURE < 5º C
FILL (2)	AS NEEDED	OPEN	CLOSED	CLOSED	PRESET BASED ON CHAMBER SIZE; COOL VALVE CYCLES TO KEEP CHAMBER TEMPERATURE < 5º C
HEAT	CLOSED	CLOSED	CLOSED	CLOSED	
BLEED	CLOSED	CLOSED	CLOSED	OPEN	BLEED VALVE CLOSES WHEN PRESSURE < 400 PSI
VENT	CLOSED	CLOSED	OPEN	CLOSED	PURGE VALVE STAYS OPEN UNTIL POWER IS TURNED OFF

FIG. 16